Spectroscopy & the Dynamics of Molecular Biological Systems

Edited by P.M. Bayley and R.E. Dale

Academic Press; London, 1985

xiii + 406 pages. £38.50, $42.50

Some fifteen years ago it was assumed that the relationship between composition (sequence) and structure to function was straightforward. Attempts were then made to establish even enzyme mechanisms on the basis of refined X-ray diffraction structures. The development of high-resolution NMR methods quickly made everyone aware that the actual relationship was not direct and that the real relationship was between composition (sequence), dynamics within structure, and function. The use of even X-ray diffraction today extends to the study of some motions of low amplitude. The advances using these two methods are deliberately excluded from this book since there is a Ciba Foundation Volume (No. 93) which covers them. Here in 18 chapters by 41 authors the approaches used are optical, scattering (at various wavelengths) or EPR spectroscopies, together with powerful theoretical analyses of relaxation processes. The time resolution of the methods covers a very large range from picoseconds to days. The structural resolution is often poor in the sense that it is rarely atomic but many of the processes under study do not demand such resolution. Some examples of what these methods achieve are in areas where diffraction and NMR methods are not valuable. Interesting examples are the motions of molecules in simple free or viscous solution and in membranes. It is now established that some regions in and around cells are quite viscous. Again we now know that assembly and disassembly of structures in membranes can be quite rapid on the millisecond scale. The rotational motions in any medium, aqueous or membranes, can be exceedingly rapid – in the nanosecond range. Even faster processes in the picosecond range are open to study by many of the techniques discussed here. These processes are usually concerned with light-dependent excited states. While the book gives many examples it is over-ridingly a book about techniques. As such I found it to be very good indeed and very readable. The methods are bringing to our attention many dynamic processes which are at the heart of living systems.

R.J.P. Williams

Genome Multiplication in Growth and Development: Biology of Polyploid and Polytene Cells

(Developmental and Cell Biology Series no. 15)

by V.Y. Brodsky and I.V. Uryvaeva

Cambridge University Press; Cambridge, 1985

305 pages. £39.50, $79.50

Biological research in the Soviet Union rarely makes the headlines in Western mainstream journals. A few Russian books on biological themes have made an appearance in English translation,

and sometimes these have looked at familiar topics in a refreshingly new light (for instance G.V. Lopashov's 'Developmental Biology of the Vertebrate Eye Rudiment'). In the book under review, Brodsky and Uryvaeva have examined a frequently neglected aspect of growth and development, namely the roles of polyploidy and polyteny. The authors' main concern is not with polytene chromosome puffing, etc. but rather with the origins and functional significance of polyploid and polytene genomes, in particular the blockage of post-S-phase events in the mitotic cycle.

The book is divided into 9 chapters, though the last two could easily have been fused. After a brief historical introduction and definition of terms, the remaining four chapters of part I survey the occurrence of polyploidy and polyteny in vertebrates and invertebrates, then more briefly in plants and protozoa. Part II considers various mechanisms for genome multiplication and finally their possible significance. The presentation is clear and reasonably concise, though there is a tendency to become laboured in areas on which the authors have worked (for instance, 15 pages on polyploid liver cells seemed a little excessive). Another problem is that points made early in the book are frequently repeated later on; thus polyploid liver cells reappear several times in part II. On the whole, the authors stick closely to their theme, and topics such as gene amplification, chromosome diminution, genetic control of the cell cycle, and the significance of cellular oncogenes are touched on only briefly. Many of the illustrations are taken directly from the literature, which makes them less informative to the non-specialist reader. The book is extensively referenced, summarising many papers by Soviet researchers published only in Russian.

The main problem in attributing developmental (or evolutionary) significance to polyploidy and polyteny is simply that neither phenomenon is universal – even in the corresponding tissues of related species or groups. Thus functioning mammalian megakaryocytes are always polyploid, yet the functionally equivalent thrombocytes of salamanders are merely diploid. Likewise, giant polytene neurones occur only in some gastropod species. In view of this variability, the significance of each manifestation needs to be looked at on its own terms, and this the authors attempt to do in part II. The result is somewhat discursive and few substantial conclusions emerge. In its lack of generalisations, this book differs markedly from Walter Nagl's 'Endopolyploidy and Polyteny in Differentiation and Evolution' (1978), which ranges far more widely and speculatively into gene regulation, genome structure and evolutionary strategies. In summary, this is a sound and cautious review of the topic, but not one that will raise many eyebrows. It should be of value to cytologists, but is perhaps of peripheral interest to most developmental biologists. A thirty page summary of its contents would form a useful chapter in a book on the cell cycle and its control, but in its present form this text is too detailed and narrow in scope for undergraduate use.

D.I. de Pomerai

Gene Structure and Expression

by John D. Hawkins

Cambridge University Press; Cambridge, London, New York, New Rochelle, Melbourne, Sydney, 1985

xii + 174 pages. £20.00, $34.50 (hardback); £7.95, $14.95 (paperback)

According to the introduction, this book is intended for medical students but it stated to be of use also to honours and graduate students in genetics and biochemistry. The topics covered in 13 brief chapters include the following: DNA and RNA, methodology, vectors in recombinant DNA work, prokaryotic gene organisation and expression, the operon concept, eukaryotic gene organisation and expression, gene amplification, DNA sequences involved in the control of gene expression, and